PATENT COOPERATION TREATY

PCT

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)* see form PCT/ISA/210 (second sheet)	
Applicant's or agent's file reference see form PCT/ISA/220	**FOR FURTHER ACTION** See paragraph 2 below
International application No. PCT/GB2005/000261	International filing date *(day/month/year)* 27.01.2005
Priority date *(day/month/year)* 28.01.2004	
International Patent Classification (IPC) or both national classification and IPC C08J5/00, C08K3/00, D01F1/10, A61L15/16, A61L15/28	
Applicant QINETIQ NANOMATERIALS LIMITED	

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:

European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized Officer

Vaccaro, E

Telephone No. +49 89 2399-6049

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/GB2005/000261

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material:

   ☐ a sequence listing

   ☐ table(s) related to the sequence listing

   b. format of material:

   ☐ in written format

   ☐ in computer readable form

   c. time of filing/furnishing:

   ☐ contained in the international application as filed.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	18-38
	No:	Claims	1-17, 39-42
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-42
Industrial applicability (IA)	Yes:	Claims	1-42
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1: Mat. Res. Soc. Symp. Proc. 740, 179-184 (2002)
D2: US 2002/0156170 A
D3: US 2002/0122832 A
D4: WO 02/062402 A
D5: WO 02/36866 A
D6: EP 0905289 A

1. The present application claims a method of producing a polymer composite comprising a polymer matrix having metal nanoparticles incorporated therein, said method comprising the steps of (a) mixing metal nanoparticles with a polymer dope, and (b) solidifying the polymer composite from the dope (claim 1). Fibers produced by said method are also claimed (claim 18), along with a wound dressing comprising said fibers (claim 19) and a woven or non-woven article comprising said fibers (claim 20). Claim 21 seeks protection for fibres comprising a polymer matrix wit metal nanoparticles comprised therein, which, according to the commonly acknowledged principle of "product-by-process" claim, corresponds to claim 18. Other independent claims 37-42 claim a wound dressing made specifically of alginate/silver nanoparticles fibers, a fabric comprising generic polymer/metal nanoparticles fibers, a polymer composite comprising a polymer matrix and metal nanoparticles incorporated therein, the use of the composite material, or fibers or fabric in antimicrobial application.

2. D1 discloses a process for the preparation of metal nanoparticles/polymer composites comprising the steps of dissolving a polymer (PMMA) in a mixture of a suspension of silver nanoparticles and a solvent. The resulting product is a polymer nanocomposite where silver nanoparticles are dispersed in a polymer matrix (PMMA), thereby disclosing the subject-matter of claim 39 of the present application. The PMMA/Ag nanoparticle composite of D1 is shown to have an antibacterial activity

(Fig. 6). Thus, also claim 40 of the present application appears to be not novel over D1. Consequently, claims 41 and 42 lack also novelty over D1 (Art. 33(2) PCT).

3. D2 discloses a nanocomposite material comprising a polymer matrix and metal nanoparticles (pars. [0016]-[0021]). A process where a dispersion of metal nanoparticles is added to a polymer matrix dope prior to solidification of the composite is disclosed as well ([0039] and [0041]; Figs. 3 and 5; example 2; claim 9). Thus, neither the process of claim 1 of the present application nor the composite material of claims 39, 41 and 42 are new over D2 (Art. 33(2) PCT).

4. Example 2 and claim 6 of D3 disclose a composite material made of polypropylene and silver nanoparticles. Said composite material takes away the novelty of claims 39, 41 and 42. Its antimicrobial activity (shown in example 3 of D3) anticipates the disclosure of claim 40 of the present application. Thus, claims 39-42 are not new over D3 (Art. 33(2) PCT).

5. D4 discloses a composite material comprising a polymer matrix containing silver nanoparticles (examples). The subject-matter of claims 39-42 does not appear to be new over D4 (Art. 33(2) PCT).

6. D5 discloses the preparation of antimicrobial polysaccharide fibers containing a powder of a ceramic silver compound (example 1). D6 discloses antibacterial cellulose fibers containing particles of a silver zeolite. In both documents, the fibers are spun in an aqueous solution. The subject-matter of claims 18-38 is concerned with fibers comprising a polymer and metal nanoparticles. The size of the silver compound of D5 and of the silver zeolite of D6 is not disclosed in the respective documents. In the present invention, the particles may have diameters of a few nanometers to a few hundred, and they can comprise a metal, a metal alloy or a metalloid or a combination of these (paragraph bridging pages 2 and 3). The silver compound of D5 (a silver sodium hydrogen zirconium phosphate) and the silver zeolite of D6 do not fall under this definition of metal particles. Thus, novelty over D5 and D6 is acknowledged to the subject-matter of claims 18-38.

7. D5 is regarded as the closest prior art for the assessment of the presence of an

inventive step according to Art. 33(3) PCT. The problem to be solved by D5 is the provision of antimicrobial properties to polysaccharide fibers (page 2, lines 13-14). The same technical problem is also the objective of the present application. The solution provided in D5 is to add particles of a silver-based compound to the fibers. The process is the same as in the present application, which should result in polysaccharide fibers have the silver compound particles uniformly distributed along the diameter. The present application differs from D5 in that metal (silver) nanoparticles are used. Said metallic nanoparticles have antibacterial activity based on the oxidation in the presence of air and hydrolysis in the presence of humidity to yield metal ions (Ag+ in the case of silver) which are the actual active germicides. This is to say that presumably the same mechanism applies in the case of the compound of D5, which contains silver ions, and the silver nanoparticles of the present application. Thus, the difference between the present application and D5 resides only in the size of the antibacterial particles, assuming that the silver compounds of D5 are not nanosized. Selecting a different particle size in a composite, being everything else the same, i.e. the process for its manufacture and the materials, does not appear to be involving an inventive step if it is not associated with an unexpected technical effect. No such effect is shown in the application and, therefore, the presence of an inventive step cannot be acknowledged to the subject-matter of independent claims 18-21, 37, 38 with respect to D5 (Art. 33(3) PCT).

8. Dependent claims 2-17, 22-36 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step, as said features are obvious to the person skilled in the art (see documents D1-D6 and the corresponding passages cited in the search report).

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Name and mailing address of the ISA:

European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized Officer

Vaccaro, E

Telephone No. +49 89 2399-6049

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